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**EP-A- 0 288 879**
**DE-U- 8 805 390**
**US-A- 4 666 435**

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## Description

This invention relates to hypodermic needles, and especially a syringe assembly, and specifically to such an assembly that is safe to use in a medical environment.

Typical means for ensuring the sterility of a hypodermic needle prior to use, and for the protection of a handler subsequent to use, include the familiar cap that seats on a collar surrounding the needle. However, these caps do not reliably protect persons handling the syringe after use. There have been numerous instances of injuries and consequent infection caused by users trying to slide a cap back over a needle, and in doing so puncturing their own skins. While in many instances little harm results from such injuries, with the advent of auto-immune disease syndrome (AIDS) medical persons have viewed with greater alarm the ease with which a potentially contaminated needle can puncture the skin of anyone handling the syringe subsequent to the administration of an injection to or the withdrawal of blood from a patient who may have a highly communicable disease.

The typical modern syringe is a disposable item having a plunger, barrel and needle with a protective cap over the needle. Many attempts have been made to improve on the conventional needle protection means described above, and perhaps the most relevant known to applicant is disclosed in US-A-4,536,822 granted on November 2, 1982 (Winstead-Hall). The syringe disclosed in the patent has the usual barrel, plunger and needle, however, an additional sleeve is slidable over the barrel. The primary purpose of the sleeve is to provide a means for determining precisely the depth of penetration of the needle 6, in Figure 1 of the patent, into human tissue. The patentee clearly had in mind safety, i.e., minimizing undesired puncture wounds by the users, however, the patent does not address the problem of the security of the sleeve when it is positioned over the needle subsequent to the use of the syringe.

A further proposal for a shielded medical syringe is disclosed in US-A-4,666,435 issued May 19th, 1987 in the name of Paul A. Braginetz. This arrangement includes a telescoping shield, the syringe barrel having a series of molded surfaces consisting of flat edges and the like to allow movement and locking of the shield in both the in use position (Figures 3 and 4) and in the disposable position (Figure 9). However, in this reference the thickness of the plastic of the syringe barrel 11 varies around the diameter, and furthermore in the use position (Figures 3 and 4) the shield 37 covers about one half the length of the barrel. Furthermore, the shield has a protruding collar 50A,50 at its rear end positioned about half way along the barrel, which makes it difficult to accurately view the contents of the barrel during filling and dispensing.

DE-U-88 05 390 discloses a syringe cylinder having an open ended outer plastic jacket which can slide over the cylinder and includes a projecting button in its distal part that cooperates with a guide groove in the wall of the syringe barrel, there being locking mechanisms at the proximal and distal ends of the guide groove to determine the extent of motion of the protective jacket relative to the syringe barrel. Locking is effected by blocking out the guide groove by a compressible wedge-shaped plastic part which allows the protective jacket button to pass in one direction with the moderate application of pressure, but then assumes its old form and blocks the return path. The wedge-shaped plastic part that forms the locking mechanism is compressible, and apparently therefore is not of the same material as the syringe barrel. Furthermore its compressibility must call into question its ability to effectively block the return path of the protective jacket button.

The present invention provides a syringe comprising:

a barrel having a hypodermic needle mounted on one end thereof, said barrel being of transparent cylindrical form over the major portion of its length;

a piston mounted for movement longitudinally within said barrel and connected to a handle that projects from the opposite end of said barrel;

a tubular sleeve dimensioned to fit over said barrel, and mounted to be slidable therealong, said sleeve having an internal projection and being movable axially between an extended position wherein it projects from said one end of said barrel beyond the tip of said needle and a retracted position wherein it coaxially surrounds said barrel and exposes said needle for use, said sleeve having a length that corresponds to that of said barrel and comprises a cylindrical wall that is transparent such that in said retracted position it affords unimpeded visibility of the interior of said barrel;

first locking means for securely locking said sleeve in said extended position in which said needle is fully covered to prevent injury to a user by said needle, said first locking means comprising a locking recess in said barrel into which recess said internal projection can be positioned by predetermined movement of said sleeve relative to said barrel in said extended position;

and a second locking means to secure said sleeve when in said retracted position against movement relative to said barrel;

characterized in that in the approach to said locking recess said barrel includes an inclined ramp to guide and facilitate entry of said projection into said recess, said inclined ramp being formed

in said barrel, and said recess being defined by walls integral with said barrel such that said first locking means is not disengageable whereas said second locking means is disengageable.

The preamble of claim 1 is known from DE-U-88 05 390 The second locking means, which is preferably selectively re-engageable, retains the sleeve over the barrel to prevent inadvertent displacement of the sleeve so that the clear central portion of the sleeve provides unimpeded viewing of the barrel up to and during the time of use. After use the sleeve is moved to its extended position and the first locking means are engaged to securely lock the sleeve in this position.

Preferably, a screw-on cap is provided to place over the end of the sleeve once it has been fully extended and locked in position.

The invention provides a cheaply constructed, disposable syringe that materially improves safety in that a deliberate and almost self-destructive act would be required before the needle could contaminate the user.

In the drawings, which illustrate embodiments of the invention;

Figure 1 is a side elevation of a syringe according to the invention;

Figure 2 is a view similar to Figure 1 with its protective sheath extended;

Figure 3 is an illustration of the syringe with the sheath separated therefrom, and;

Figure 4 is a section on the line 4-4 of Figure 2.

In the drawings, 10 is a syringe having a transparent cylindrical barrel 11, a plunger 12 bearing a piston 15, and a needle 13. Indicia 14 on the barrel 11 indicate, by reference the end of the piston 15, the amount of fluid drawn into the syringe.

A tubular cylindrical sleeve 16 is dimensioned to fit closely over the barrel 11 so that in its initial position it covers the barrel 11 entirely, allowing the needle 13 to project beyond the end of the sleeve, that is, to the left in Figure 1. The sleeve 16 is transparent and is of substantially uniform thickness over the major portion of its length so that when the sleeve 16 is in its initial, retracted position as shown in Figure 1, the barrel 11 and its contents as well as the indicia 14 are clearly visible over their entire extent. The syringe is provided, as packaged, with a standard smaller sleeve 17 of the type known in art which, in the case of the present invention, is removed prior to use and discarded, since it need not be used again. Barrel 11 and sleeve 16 are formed from a suitable plastic material.

The sleeve 16 is secured prior to use by the screw threads at 24 on the outside of the barrel 11, and matching screw threads 25 on the inside of the distal end of the sleeve. The screw threads 24 are formed, in a manner known in the art, such that a quarter-turn of the sleeve 16 in relation to the barrel 11 releases the sleeve 16 for axial movement along the barrel 11. In Figure 2, the sleeve 16 is shown fully extended to a position where it entirely covers the needle 13, and it is impossible to make accidental physical contact with the needle. Preferably, a cap 8 is provided having external threads 26 matching the threads 25. The cap is packaged with the syringe 10 and used to ensure the safety of the assembly after use.

Illustrated on the outside of the barrel 11 is a formation, in the plastic material from which the barrel is formed, of a feature critical to the invention, i.e., the aforementioned secure locking means. Formed on the inside of the sleeve 16 is a protrusion 18 that extends radially inwardly a short distance corresponding to a groove 19 (Figure 2) formed in the outside of the barrel 11. The groove 19 extends axially along the barrel, and at its right hand or inner end extends circumferentially as at 30 to permit the aforementioned quarter turn locking of the sleeve in the rest position via the threads 24,25. This lateral extension 30 of the groove 19 therefore extends over a quarter, or slightly more than a quarter, of the circumference of the barrel 11. The depth of the lateral extension 30 of groove 19 is such that the protrusion 18 will enter and form a tight fitting frictional engagement therewith. The protrusion will thus be frictionally held in the extension 30 and requires substantial force to be applied to disengage it and move it into alignment with the groove 19. This frictional engagement between the extension 30 and the protrusion 18 provides a further locking means to retain the sleeve 16 in the retracted position. At the opposite or outer end of the groove 19, a ramp 31 is formed extending in depth from its maximum at the groove 19 radially outwardly to a recess 32 corresponding in size and shape to the protrusion 18. Thus, once the sleeve has been rotated a quarter turn freeing it from the threads 24 and freeing it from the portion 30 of the groove, the sleeve can be pulled along the barrel with the protrusion 18 engaged in the groove 19 to its outermost or left hand position. Rotation of the sleeve 16 then causes the protrusion 18 to ride resiliently up the ramp 31 (this movement being accommodated by flexure of the sleeve 16 and/or the barrel 11) and drop into the recess 32, thus locking the sleeve firmly in the disposal position shown in Figure 2. It will be appreciated that the sleeve 16 cannot be removed from the locked position without considerable force applied either torsionally or axially and as a consequence the user is protected, as are, for example, cleaning staff. The cap 8 is subsequently screwed into position in the barrel to complete the protective covering.

It will also be understood that while the invention is primarily intended for use with a syringe, other assemblies having percutaneous needles can be equipped in like manner with protective sleeves.

## Claims

1. A syringe (10) comprising:
   a barrel (11) having a hypodermic needle (13) mounted on one end thereof, said barrel being of transparent cylindrical form over the major portion of its length;
   a piston (15) mounted for movement longitudinally within said barrel and connected to a handle (12) that projects from the opposite end of said barrel;
   a tubular sleeve (16) dimensioned to fit over said barrel, and mounted to be slidable therealong, said sleeve having an internal projection (18) and being movable axially between an extended position wherein it projects from said one end of said barrel beyond the tip of said needle and a retracted position wherein it coaxially surrounds said barrel and exposes said needle for use, said sleeve (16) having a length that corresponds to that of said barrel (11) and comprising a cylindrical wall that is transparent such that in said retracted position it affords unimpeded visibility of the interior of said barrel;
   first locking means (18,32) for securely locking said sleeve in said extended position in which said needle is fully covered to prevent injury to a user by said needle, said first locking means comprising a locking recess (32) in said barrel into which recess (32) said internal projection (18) can be positioned by predetermined movement of said sleeve (16) relative to said barrel (11) in said extended position;
   and a second locking means (18,30; 24,25) to secure said sleeve when in said retracted position against movement relative to said barrel;
   characterized in that in the approach to said locking recess (32) said barrel includes an inclined ramp (31) to guide and facilitate entry of said projection into said recess, said inclined ramp being formed in said barrel, and said recess being defined by walls integral with said barrel such that said first locking means (18,32) is not disengageable whereas said second locking means (18,30; 24,25) is disengageable.

2. A syringe according to claim 1 characterized in that said projection (18) on the inside of said sleeve co-operates with a mating groove (19) extending along the outside of said barrel, the ends of said groove being adjacent the ends of said barrel, said inclined ramp (31) extending from said groove and terminating at said recess (32) at said projection (18) being movable along said groove (19) as said sleeve is moved along said barrel until said projection registers with said ramp, further movement of said sleeve causing said projection to move up said ramp (31) and then to drop into said recess (32) to lock said sleeve in the extended position.

3. A syringe according to claim 1 or claim 2, characterized in that said second locking means is selectively disengageable and reengageable and comprises a screw-thread (25) formed on an end portion of said sleeve (16) and engageable with a mating screw-thread (24) formed on said barrel when said sleeve is in the retracted position to lock said sleeve against axial movement, said groove (19) having a circumferential extension (30) to accommodate said projection (18) during rotation of said sleeve upon engagement or disengagement of said mating screw threads (24,25).

4. A syringe according to claim 3 characterized in that the rotation of said sleeve to effect full engagement of said screw-threads (24,25) amounts to approximately one quarter of a full rotation.

5. A syringe according to claim 3 or 4 characterized by a screw-threaded cap (8) engageable with said screw-thread (25) on said sleeve when the latter is in the extended condition to completely close the associated end of the sleeve.

6. A syringe according to any of the preceding claims characterized in that said sleeve (16) is of molded plastic material and the cylindrical wall thereof is of substantially constant thickness over at least the major part of its length to provide unimpeded viewing of the barrel therethrough.

## Patentansprüche

1. Spritze (10) mit einem Zylinder (11) und einer an einem Ende des Zylinders angebrachten hypodermalen Nadel (13), wobei der Zylinder über den Großteil seiner Länge eine transparente, zylindrische Form hat; einem Kolben (15), der in Längsrichtung beweglich innerhalb des Zylinders angeordnet und mit einem Griff (12) verbunden ist, welcher an dem entgegengesetzen Ende des Zylinders vorsteht; einer

rohrförmigen Hülse (16), die so bemessen ist, daß sie über den Zylinder paßt, und die über dem Zylinder verschiebbar angeordnet ist, wobei die Hülse einen nach innen gerichteten Vorsprung (18) aufweist und zwischen einer ausgezogenen Stellung, in der sie von dem einen Ende des Zylinders über die Spitze der Nadel vorsteht, und einer eingezogenen Stellung, in der sie das Zylinder koaxial umgibt und die Nadel zum Gebrauch freigibt, axial beweglich ist, und wobei die Hülse (16) eine der Länge des Zylinders (11) entsprechende Länge aufweist und eine zylindrische Wand hat, die so transparent ist, daß sie in der eingezogenen Stellung eine ungehinderte Sichtbarkeit des Zylinderinneren gewährleistet; einem ersten Verriegelungsmittel (18, 32) zum sicheren Verriegeln der Hülse in der ausgezogenen Stellung, in der die Nadel vollständig abgedeckt ist, um eine Verletzung eines Anwenders durch die Nadel zu verhindern, wobei das erste Verriegelungsmittel eine Rast (32) in dem Zylinder umfaßt, in welcher der nach innen gerichtete Vorsprung (18) durch eine vorbestimmte Bewegung der Hülse (16) in bezug auf den Zylinder (11) in der ausgezogenen Stellung positioniert werden kann; und einem zweiten Verriegelungsmittel (18, 30; 24, 25) zur Sicherung der Hülse gegen eine Bewegung in bezug auf den Zylinder in der eingezogenen Stellung, dadurch gekennzeichnet, daß der Zylinder am Zugang zu der Rast (32) eine schräge Rampe (31) zur Führung und zur Erleichterung des Eintretens des Vorsprungs in die Rast aufweist, wobei die schräge Rampe in dem Zylinder gebildet und die Rast durch in den Zylinder integrierte Wände definiert ist, so daß das erste Verriegelungsmittel (18, 32) nicht entriegelbar und das zweite Verriegelungsmittel (18, 30; 24, 25) entriegelbar ist.

2. Spritze nach Anspruch 1, dadurch gekennzeichnet, daß der Vorsprung (18) im Inneren der Hülse mit einer zugehörigen Rille (19) zusammenwirkt, die sich entlang der Außenseite des Zylinders erstreckt, wobei die Enden der Rille an die Enden des Zylinders angrenzen, die schräge Rampe (31) sich von der Rille aus erstreckt und an der Rast (32) endet, und wobei der Vorsprung (18) entlang der Rille (19) beweglich ist, wenn die Hülse das Zylinder entlang bewegt wird, bis sich der Vorsprung mit der Rampe deckt, und eine weitere Bewegung der Hülse den Vorsprung veranlaßt, sich die Rampe (31) hinaufzubewegen und dann in die Rast (32) einzurasten, um die Hülse in der ausgezogenen Stellung zu verriegeln.

3. Spritze nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das zweite Verriegelungsmittel selektiv entriegelbar und wieder verriegelbar ist und ein an einem Endbereich der Hülse (16) gebildetes Schraubengewinde (25) umfaßt, welches in ein an dem Zylinder gebildeten zugehörigen Schraubengewinde (24) eingreifen kann, wenn sich die Hülse in der eingezogenen Stellung befindet, um die Hülse gegen eine axiale Bewegung zu sichern, und daß die Rille (19) eine Verbreiterung (30) im Mantel aufweist, um den Vorsprung (18) während einer Drehung der Hülse beim Zusammen- oder Auseinanderschrauben der zusammengehörigen Schraubengewinde (24, 25) aufzunehmen.

4. Spritze nach Anspruch 3, dadurch gekennzeichnet, daß die Drehung der Hülse, um ein vollständiges Ineinandergreifen der Schraubengewinde (24, 25) zu bewirken, etwa eine Vierteldrehung beträgt.

5. Spritze nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß eine mit einem Schraubengewinde versehene Kappe (8) vorhanden ist, die mit dem Schraubengewinde (25) auf der Hülse zusammenwirkt, wenn sich die Hülse in der ausgezogenen Stellung befindet, um das zugehörige Ende der Hülse vollständig zu verschließen.

6. Spritze nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Hülse (16) aus Spritzguß-Kunststoff besteht und die zylindrische Wand der Hülse über wenigstens den Hauptteil ihrer Länge eine im wesentlichen konstante Dicke besitzt, um eine ungehinderte Sichtbarkeit des Zylinders durch die Hülse zu gewährleisten.

**Revendications**

1. Seringue (10) comprenant :

un corps (11) avec une aiguille hypodermique (13) montée sur l'une de ses extrémités, le corps étant de forme cylindrique transparente sur la plus grande partie de sa longueur ;

un piston (15) monté pour le mouvement longitudinal à l'intérieur du corps et raccordé à une poignée (12) qui fait saillie à partir de l'extrémité opposée du corps ;

un fourreau tubulaire (16), dimensionné de façon à s'adapter sur le corps et, monté de façon à coulisser le long de celui-ci, le fourreau ayant une saillie interne (18) et étant mobile axialement entre une position sortie dans laquelle il fait saillie à partir d'une extré-

mité du corps au-delà de la pointe de l'aiguille et une position rentrée dans laquelle il entoure coaxialement le corps et met l'aiguille à nu pour l'utilisation, ce fourreau (16) ayant une longueur qui correspond à celle du corps (11) et comprenant une paroi cylindrique qui est transparente de sorte que dans la position rentrée, elle offre une visibilité parfaite de l'intérieur du corps ;

des premiers moyens de verrouillage (18, 32) pour bloquer en toute sécurité le fourreau dans la position sortie dans laquelle l'aiguille est entièrement recouverte pour supprimer les risques de blessure de l'utilisateur de l'aiguille, les premiers moyens de verrouillage comprenant un évidement de verrouillage (32) dans le corps, évidement (32) dans lequel, la saillie interne (18) peut être positionnée par un mouvement prédéterminé du fourreau (16) par rapport au corps (11) dans la position sortie ;

et des seconds moyens de verrouillage (18, 30 ; 24, 25) pour assujettir le fourreau lorsqu'il se trouve dans la position rentrée en opposition au mouvement par rapport au corps ;

caractérisée en ce que dans la partie d'approche de l'évidement de verrouillage (32), le corps comprend une rampe inclinée (31) pour guider et faciliter l'entrée de la saillie dans l'évidement, cette rampe inclinée étant formée dans le corps, et l'évidement étant défini par des parois solidaires du corps de telle sorte que les premiers moyens de verrouillage (18, 32) ne sont pas désolidarisables tandis que les seconds moyens de verrouillage (18, 30 ; 24, 25)) sont désolidarisables.

2. Seringue selon la revendication 1, caractérisée en ce que la saillie (18) sur le côté interne du fourreau coopère avec une gorge correspondante (19) s'étendant le long de la partie extérieure du corps, les extrémités de cette gorge étant contiguës aux extrémités du corps, la rampe inclinée (31) s'étendant à partir de cette gorge et aboutissant au niveau de l'évidement (32) sur la saillie (18) mobile le long de la gorge (19) à mesure que le fourreau se déplace le long du corps jusqu'à ce que la saillie coïncide avec la rampe, le mouvement ultérieur de la gorge provoquant le déplacement de la saillie jusqu'à la rampe (31) puis son introduction dans l'évidement (32) pour verrouiller le fourreau dans la position sortie.

3. Seringue selon la revendication 1 ou 2, caractérisée en ce que les seconds moyens de blocage sont sélectivement désolidarisables et resolidarisables et comprennent un filetage (25) formé sur une portion d'extrémité du fourreau (16) et solidarisable avec un filetage correspondant (24) formé sur le corps lorsque le fourreau se trouve dans la position rentrée pour verrouiller le fourreau en opposition axiale, cette gorge (19) ayant un prolongement circonférentiel (30) pour recevoir la saillie (18) pendant la rotation du fourreau lors de la solidarisation ou de la désolidarisation du filetage correspondant (24, 25).

4. Seringue selon la revendication 3, caractérisée en ce que pour effectuer le plein engagement du filetage (24, 25) la rotation du fourreau est d'environ un quart de rotation complète.

5. Seringue selon la revendication 3 ou 4, caractérisée par un capuchon fileté (8) solidarisable avec le filetage (25) sur le fourreau lorsque ce dernier est dans la condition sortie pour fermer complètement l'extrémité affectée du fourreau.

6. Seringue selon l'une quelconque des revendications précédentes, caractérisée en ce que le fourreau (16) est en plastique moulé et la paroi cylindrique est d'une épaisseur sensiblement constante sur au moins la plus grande partie de sa longueur pour assurer une visibilité parfaite de la totalité du corps.

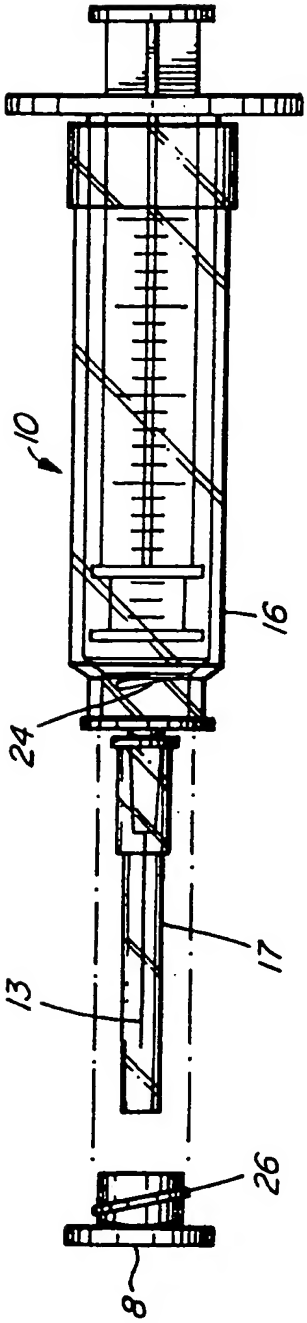


FIG. 1

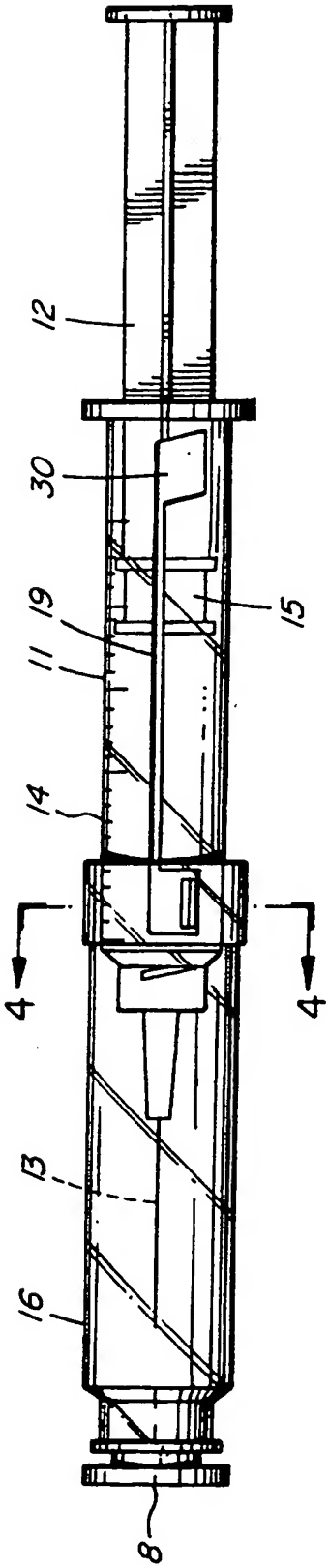


FIG. 2

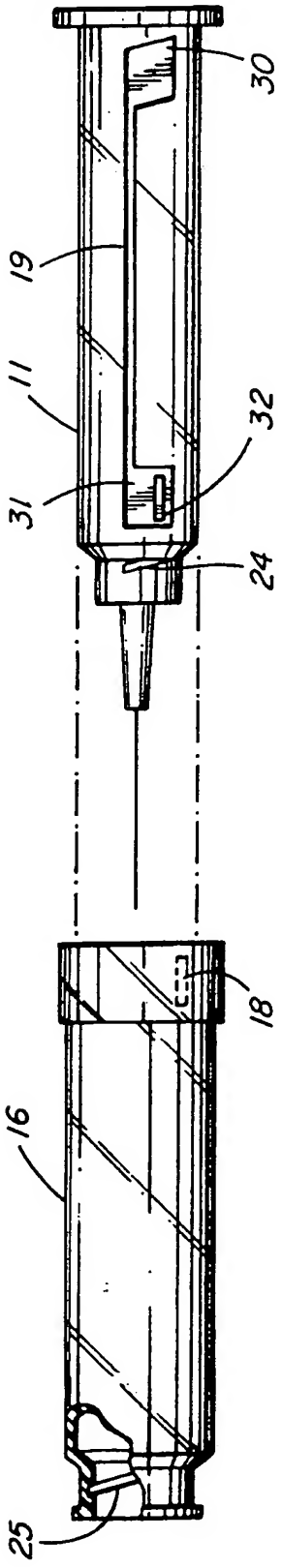


FIG. 3

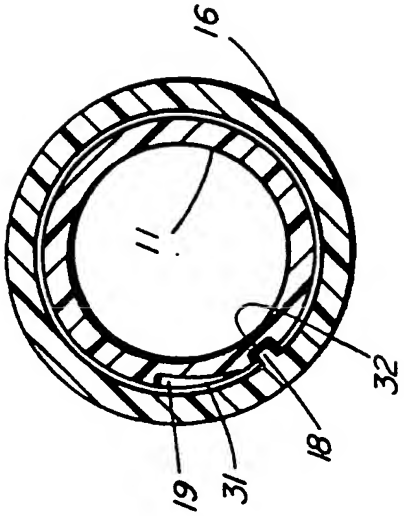


FIG. 4